The compositions can comprise, consist essentially of, or consist of the stated materials. The method can comprise, consist essentially of, or consist of the stated steps with the stated materials.

DETAILED DESCRIPTION OF THE EMBODIMENTS OF THE INVENTION

As is disclosed in Mondshine U.S. Pat. No. 4,369,843, incorporated herein by reference, it is desirable to remove the filter cake or seal from the surface of a borehole in a hydrocarbon-containing formation in order to obtain maximum hydrocarbon production. Thus if the bridging particles in the filter cake are water soluble as disclosed therein, it is disclosed that the bridging particles can be dissolved and removed by the flow of produced field brine or by the injection of water or an unsaturated saline solution. If the bridging particles are acid soluble or oil soluble, there are utilized strongly acid solutions or oil, respectively, to remove the bridging particles.

It has now been determined that the presence of polysaccharide polymers in the filter cake or seal substantially increases the time required to remove the filter cake due to the encapsulation of the bridging particles by the polysaccharide polymer, and that considerable polysaccharide polymer remains on the surface of the borehole after the bridging particles are removed. Furthermore, it has been determined that the present method of removing the filter cake, wherein a wash liquid in which the bridging particles are soluble is used, does not adequately remove all of the filter cake due to the breakthrough of the wash liquid through a portion of the filter cake resulting in the wash liquid then being lost to the hydrocarbon-containing formations. Thus the wash liquid not only doesn't adequately remove the filter cake, it also may harm the formation depending on its composition and other characteristics as is well known in the art.

The water soluble polysaccharide polymers which may be present in the filter cake may be any of such polymers well known in the art. See for example the book "Handbook of Water-Soluble Gums and Resins," Robert L. Davidson, Editor, McGraw-Hill Book Co., 1980, incorporated herein by reference. Representative polymers include water soluble salts of alginic acid, carrageenan, gum agar, gum arabic, gum ghatti, gum karaya, gum tragacanth, locust bean gum, tamarind gum, cellulose derivatives such as hydroxyethyl cellulose, hydroxypropyl cellulose, carboxymethyl cellulose, hydroxyethyl carboxymethyl cellulose, and the alkyl cellulose ethers, starch ether derivatives such as carboxymethyl starch, hydroxyethyl starch, hydroxypropyl starch, and crosslinked starch ethers, guar gum and its derivatives, such as hydroxypropyl guar, hydroxyethyl guar and carboxymethyl guar, biopolymers such as xanthan gum, gellan gum, welan gum, and the like. Usually the polysaccharide polymer is a cellulose ether, a starch ether which may be crosslinked, a modified guar gum, xanthan gum, gellan gum, welan gum, or mixtures thereof.

The invention is based on the discovery that a filter cake containing one or more polysaccharide polymers and bridging particles can be removed from the surface of hydrocarbon-containing formations by contacting the filter cake with a brine fluid comprising a peroxide selected from the group consisting of alkaline earth metal peroxides, zinc peroxide, and mixtures thereof, an aqueous brine, and an acidic substance to provide the soak solution with a pH in the range from about 1 to about 8, and, optionally, an activator for the peroxide for a period of time at least sufficient to decompose the polysaccharide polymers therein and to at least partially dissolve the bridging particles therein such that the filter cake is removed from the formation, and thereafter circulating said peroxide-containing fluid out of said borehole, wherein the bridging particles in the filter cake are solubilized by the filter cake contacting fluid and the fluids which subsequently contact the filter cake-free formation.

The invention is also based on the discovery of a two step method of removing filter cakes containing one or more polysaccharide polymers and bridging particles from the surface of hydrocarbon-containing formations which first decomposes the polysaccharide polymers without substantial solubilization of the bridging particles, and subsequently which solubilizes the bridging particles and removes the filter cake leaving substantially no polymer residue on the surface of the formation.

For the purpose of the present disclosure, the term "filter cake" is hereinafter intended to mean the filter cake or seal which is present on the surface of a hydrocarbon-containing subterranean formation, i.e., the filter cake on the sides or face of a borehole within the formation, and which contains bridging solids and one or more polysaccharide polymers. Also the term "aqueous brine" is intended to mean an aqueous solution containing one or more salts dissolved therein, such as potassium chloride, sodium chloride, ammonium chloride, and the like, and includes sea water.

The preferred process of the invention for the removal of the filter cake comprises contacting the filter cake with a novel soak solution of this invention which comprises an aqueous brine which has no appreciable solubilizing effect on the bridging solids, a peroxide selected from the group consisting of alkaline earth metal peroxides, zinc peroxide and mixtures thereof, and an acidic substance to provide the soak solution with a pH in the range from about 1 to about 8, for a period of time at least sufficient to decompose the polysaccharide polymers therein to such an extent that the filter cake forms a loosely adherent mass on the surface of the formation, and thereafter contacting the filter cake with a wash solution in which the bridging particles are soluble to remove the remaining filter cake solids. Preferably the soak solution contains an activator for the peroxide as disclosed hereinafter.

It is preferred that the soak solution have no appreciable solubilizing effect on the bridging particles within the filter cake. This prevents the premature breakthrough of the soak solution through a portion of the filter cake and, hence, allows all of the filter cake to be contacted by the soak solution until the peroxide has decomposed the polysaccharide polymers substantially. If the bridging particles are water soluble, preferably the aqueous liquid in the soak solution will be saturated with respect to the bridging particles. Thus if the bridging particles are sized sodium chloride, the aqueous liquid will preferably be saturated with respect to sodium chloride. Additionally, the soak solution should have a density which is compatible with the density of the liquid in the borehole which the soak solution displaces in order to minimize mixing of the soak solution with the liquid. Preferably the soak solution contains inorganic water soluble salts dissolved therein in amounts up to saturation to provide the desired density.